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NOTE FOR:

1. Attached is a memo which, I hope, provides in suitable form some of the rationale along the lines of our earlier discussions about developing a Large Scale Systems Analysis capability in the Agency. It is easy to identify a number of people who would certainly be movers and shakers if there is an interest in proceeding.

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2.  of course, is high on the list.  recently got his PhD  in just this area, and I know he is anxious to use these tools. I believe Jack Iams' interest in this area extends considerably beyond the computer aspects.  and his facility might be an excellent starting place, and in the memo I have mentioned  interest.  of ORD would also be interested, I am sure. The whole idea might have much appeal to the IC Group--especially  or (perhaps better) some of his people such as . In the  has a long-term interest, as does  (I think he is now with the IG). In the DDI there is considerable interest and experience in the micro area, but, for one,  an economist, attended the LSSA Course which we sponsored recently.   in ONE are interested in a peripheral way, at least. From past sessions, I would suspect that there would also be a high level of interest among some of the people in the MAG.

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MEMORANDUM FOR THE RECORD

SUBJECT: Large Scale Systems Analysis Program

This memorandum describes why an inter-Directorate effort should be initiated to assess the needs for developing a Large Scale Systems Analysis capability, indicates the current status of some relevant work, and outlines steps which might be taken to improve the Agency's position in this field.

The Requirement

There are two basic reasons why the Agency should develop a capability to use Large Scale Systems Analysis (LSSA): to assess implications of the state-of-the-art, and to determine the need for LSSA as an aid in the production of intelligence.

With respect to the first requirement, Professors J. Forrester (World Dynamics) and Dennis Meadows (Limits to Growth) have published analyses indicating possible global trends in population, capital investment, pollution, and other parameters of importance to intelligence. Although different in terms of scope and time scale from conventional intelligence estimates, these analyses, nevertheless, foreshadow the increasing need for a longer-range forward view if world leaders are to deal adequately with the problems of an increasingly interdependent and complex society. Forrester and Meadows insist that their analyses should not be regarded as predictions but rather as rough projections of alternative futures which might be realized by the adoption of various policies.

The Forrester/Meadows' work has drawn considerable attention to the need for a large scale approach, much publicity--including pro and con editorials and comments--has resulted from their work. The Club of Rome has been

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influential in this development, and will assure international consideration of the results. Meadows' study was presented initially in Moscow and then in South America prior to the presentation in Washington. In addition to the general public interest, one entire issue of the Transactions of the Systems, Man, and Cybernetics Society of IEEE was devoted largely to papers dealing with an earlier Forrester LSSA program (Urban Dynamics). [ ]

[ ] has been especially interested and involved with the Forrester/Meadows' work, and has enumerated the favorable characteristics of the model as well as deficiencies which need to be corrected. His reaction typifies the interest and comment that should be anticipated from non-government organizations interested in the future.

Given this degree of activity and interest, the press and Congress, among others, could reasonably expect the Agency to be more than casually acquainted with this development. If asked, the Director should be able, at least, to say that we are evaluating LSSA--and we should be.

With regard to the second part of the requirement, as indicated in the Implications paper, complexity and interdependence are rapidly on the increase. This in no way degrades the importance of microanalyses, i.e., the analysis of the economy of an industry, or a country, or single weapon systems, etc., but it does emphasize the new need for the development of macroanalysis capabilities to "get it all together."

The importance of a holistic approach to problems has been recognized from the earlier days of modern civilization, and it is a salient feature characterizing Chinese thought today. In the Western World, however, the rapid development of the physical sciences over the last three centuries infused the idea of breaking problems into tractable parts, finding solutions for these partial problems, and presuming that the sum of the partial solutions constituted a solution to the whole. In raising the question "Can We Survive Technology?" 17 years ago, von Neuman clearly indicated that the broadening scope of impact of technological developments would necessitate a broader and broader scope of analysis. Churchman and Akoff, both front-rank American developers of operations research techniques, have repeatedly and urgently

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warned that greater attention must be given to a holistic approach--difficult though it may be to develop.

To assure maximum credibility and utility of future intelligence estimates, relevant factors which may be new on the scene will have to be taken into account. The identification of these factors and their relationships--let alone the determination of their impact on intelligence estimates--will necessitate the development of some systematic way of dealing with this complex problem. LSSA may not be the solution--but at the present time it certainly is a good starting point--and some have already begun. For example, Meadows has now left MIT to continue his work in LSSA at Yale using a \$600,000 grant to initiate the development of models similar to the global model on a country-by-country basis.

#### Our Present Status

We have bits and pieces of people, interests, and facilities scattered throughout the organization.

Considering people first, there is a growing body of the kind of expertise which would be required in the development and management of LSSA models, and many of these people are genuinely interested. Certainly, modeling is not new to the Agency: scientific models are employed in reconnaissance programs, models are used for retargeting, and economic, epidemic, and other models, in addition to weapons exchange models, have been developed in the past and are in use. The fact that these models exist testifies to the level and diversity of professional capability among Agency employees.

With respect to LSSA, the Agency area and discipline specialists represent a unique asset. When it comes to economists and similar professionals, the Agency has what it takes--in spades.

In the matter of interest, the existing models testify to the immediate past. But [ ] in IPRD, for example, is interested in ways in which LSSA might be instrumented, and believes that a hybrid rather than a strictly digital approach might be more efficient. [ ] ONE, is trying to determine whether and how ecological problems

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should be treated from an intelligence point of view. His interest in no sense represents a commitment, but rather a look, and, of course, looks at such global problems will ultimately require an LSSA capability if they are to be handled adequately. Interest in the Agency is further demonstrated by the response to the LSSA Course which [ ] recently directed--it was oversubscribed--and we now plan for the course to be given five times in the next fiscal year.

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We have facilities in abundance.

What Can We Do

Doing is complicated by the fact that LSSA doesn't, and shouldn't, fall neatly into any Directorate's responsibilities. Those best qualified to operate the models and the necessary equipment are largely housed in the S&T Directorate. But the substantive talent is largely elsewhere--especially in the Intelligence Directorate and the Board of National Estimates. Presuming the S&T Directorate has pretty much all that is required in the way of the horse and the cart, that the substantive load will be developed elsewhere, and subject to the interest and cooperation of the other components, the DD/S&T could at this time designate a focal point--an individual to function as a point of communication, and to assume ad hoc program responsibility for getting a variety of activities underway, including:

- a. Replicate and make operational Forrester/Meadows' world models.
- b. Form an ad hoc, part-time group of associates to recommend variations of the Forrester and Meadows' parameter values and rates, and generally exercise the models in such a way as to assess the potential strengths and weaknesses.
- c. Initiate, if necessary, the development of country models, or, in consultation with Forrester/Meadows, etc., develop recommendations for work to supplement their efforts.

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d. Initiate the cataloging of existing Agency models and pertinent non-Agency models which may have utility.

e. Assess the feasibility of promoting a degree of commonalty among micro and macro-models such that an interrelated library of such models could be developed which would be mutually supporting.

As a first task, of course, and with considerable intra-Agency as well as with external consultation, an interim 2-year program should be developed for review with Agency executives, and periodic reports of "how goes it" nature should be used to evoke guidance or modifications to the program as the work progresses.

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Special Assistant to the  
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